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ABSTRACT

The Measurement and Evaluation Center of the University of Texas (Austin) conducted a validity study to assist the Department of Management Science and Information (DMSI) at the College of Business Administration in establishing a program of credit by examination for an introductory course in electronic data processing--Data Processing Analysis 310 (DPA 310). The course is required for business administration students; however, the DPA 310 course may repeat material that some students already know. The DMSI wanted to offer incoming students a test suitable for placement of computer-literate college students out of the course. The project was conducted during the 1987-88 academic year, and involved assessment of a 142-item multiple-choice test--the U.T. Austin Test for Credit in DPA 310. The test covered word processing, electronic data processing, computer systems, the electronic spreadsheet, databases, programming, artificial intelligence, use of computers in offices, and other topics. It was administered to 1,142 students who had taken the course during the fall of 1987. During mid-January 1988, the DMSI selected a minimal test score to place students out of the course and to award three hours of credit by examination to passing students. The first use of the test as a credit by examination instrument resulted in eight of the 63 examinees achieving scores at or above the decision score selected by the DMSI. Six of the eight who were eligible for credit would receive a grade of "C" and two a grade of "B." Five data tables are included. A Student Information Handout and the frequency distribution of scores received from first administration of the test are appended. (TJH)

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VALIDITY STUDY OF U.T. AUSTIN TEST FOR USE IN CREDIT BY EXAMINATION IN INTRODUCTION TO ELECTRONIC DATA PROCESSING (DPA 310) FALL 1987

Anne B. Appenzellar and H. Paul Kelley

RB-88-2 August 1988

MEASUREMENT AND EVALUATION CENTER
The University of Texas at Austin

TM 012 443

VALIDITY STUDY OF U.T. AUSTIN TEST FOR USE IN CREDIT BY EXAMINATION IN INTRODUCTION TO ELECTRONIC DATA PROCESSING (DPA 310) FALL 1987

Anne B. Appenzellar and H. Paul Kelley

At the request of the Department of Management Science and Information Systems in the College of Business Administration, The University of Texas at Austin, the Measurement and Evaluation Center (MEC) conducted a validity study designed to assist the department in establishing a program of credit by examination in Data Processing and Analysis 310 (DPA 310): Introduction to Electronic Data Processing during the 1987-1988 academic year.

The MEC administered a locally-prepared test to 1,142 students as their final examination in DPA 310 at the end of the 1987 fall semester. Test scores were analyzed during early January, 1988, in relation to student performance in the course, as measured by preliminary course grades (that is, grades evaluating all course work except the final examination grade) assigned by the instructors to the 1,134 students for whom there were matching sets of data.

During mid-January, the department selected a minimal test score to place students out of the course and to award three hours of credit by examination in DPA 310. The MEC administered the new optional placement test operationally for the first time on January 19, 1988, to students who had enrolled in DPA 310 for the spring semester. Of the 63 who took the test, eight made scores at or above the decision score selected by the department.

Method

Subjects

During the 1987 fall semester, 1,199 students were enrolled in 14 sections of DPA 310, as of the 12th class day. Two large sections (N = 280, approximately) were taught by two faculty members, and 12 sections (N = 55, approximately) were taught by six assistant instructors. As mentioned above, 1,142 students took the final examination; there were 57 (5%) who dropped out of the course.

DPA 310 is a basic introductory course in computer literacy required of candidates for the Bachelor of Business Administration degree. (DPA majors are required to take Computer Sciences 304P: Pascal Programming instead of DPA 310.) The course syllabus includes both study of a text (Computers and End-Users Software, by Athey, Day, and Zmud, published by Scott, Foresman and Company in 1987 for use with the IBM PC) and hands-on experience with the computer. Credit in Mathematics 403K: Calculus for Business and Economics, or its equivalent, is a prerequisite for DPA 310.

Because many B.B.A. students who are required to take DPA 310 have already been exposed to computers and/or have taken introductory computer courses in high school, increasing percentages of students enrolled in DPA 310 have provided evidence of boredom with repeating material they already know. To deal with the pedagogical problems that ensue from that heightened computer awareness on the part of some students, the department wanted to offer incoming students a test suitable for placement of computer-literate students out of the course, with three semester credit hours to be awarded by examination to the successful students. It was hoped that the introduction of an optional program of credit by examination would result in sections of more manageable size as well as of students with a more positive classroom attitude.

Materials

The U.T. Austin Test for Credit in DPA 310 was prepared locally by the department. It is a two-hour objective test of 142 multiple-choice questions that cover the essentials of computer literacy for use in the modern world; it examines students on their knowledge of word processing, electronic data processing, computer systems, the electronic spreadsheet, data bases, programming, artificial intelligence, use of computers in organizations--among other topics.

Development of the test was in part based upon a test file that was designed to test students' comprehension of the topics presented in the text, Computers and End-User Software, by Athey, Day, and Zmud, published by Scott, Foresman and Company in 1987.

Procedure

MEC staff members met with the faculty "expeditor" of DPA 310 in July, 1987, to plan the validity study for the 1987 fall semester. During the months while the new test was under construction, MEC staff members took the steps necessary for administration of the test during 13 different testing periods scheduled from Friday, December 11, 1987, through Thursday, December 17 (e.g., MEC reserved testing rooms, hired and trained a testing staff, provided answer sheets). MEC staff members met with the eight instructors in early December to clarify MEC's requests for preliminary course grades, to describe the types of test results MEC would provide, and to firm up a schedule of Report Sessions after the testing periods, when test results were to be exchanged for preliminary course grade rosters. Subsequently, final course grades were obtained by MEC's Data Processing Division from University records.

Test results for each section were delivered to the instructors by means of alphabetical rosters of raw test scores (Number Correct and Percentage Correct), rosters of scores arranged in descending order, frequency distributions of the scores with mean scores and standard deviations, and, finally, a set of results for the course as a whole.

Preliminary course grades were provided by the instructors to the MEC on alphabetical section rosters either on the customary four-point letter grade scale (F through A, or 0-4) or on the traditional 0-100 numerical scale.

Following completion of data collection, MEC staff members analyzed the relationship between the end-of-course test scores and the preliminary course grades to obtain for the course, overall, the mean test score and standard deviation of the test scores, the mean preliminary course grade and the standard deviation of those grades, and the coefficient of correlation between the test scores and the preliminary course grades. Frequency distributions of the Number Correct Scores (0-142 scale) were crosstabulated with the Preliminary Course Grades (0-4 scale), and regression equations were obtained to estimate expected scores on the test from the preliminary

course grades and to estimate the expected grades in the course from the test scores. Additionally, analyses were performed to estimate the accuracy of placement that would be expected to result from use of each test score as a possible decision score. A table of suggested guidelines was prepared for departmental use in selecting an appropriate decision score.

Results

Tables 1 - 4 were prepared by MEC to present the results of the validity study to the department in a meeting on January 12, 1988. The analyses were based upon 1,134 matching sets of test scores and preliminary course grades.

Table 1 shows the frequency distribution of test scores (column to left) crosstabulated with the five grade groups of F through A (columns 3-7) and for the total group of 1,134 students (column to right). Toward the bottom of the table are (a) the number and percentage of students in each grade group and in the total group and (b) the mean test score and standard deviation for each grade group and the total group. To the right are the mean preliminary course grade (2.91) and the standard deviation (0.87) of those grades; the mean test score (110.22) and the standard deviation (13.87) of those scores; and the coefficient of correlation (.60) between the test scores and the preliminary course grades.

In addition, Table 1 presents two variables that are estimated by use of the two regression equations: the Expected Grade (second column) for each test score and the Expected Score on the test (bottom row) for each grade group. For example, the minimally satisfactory grade of C (2.00) was expected for the group of students with the test score of 86. For the C grade group of students, the Expected Score on the test was 102.

Like Table 1, Table 2 also presents descriptive statistics for the total group at the lower right, but its main function is to collapse the five grade groups into two academic performance groups: Unsatisfactory (grades of F and D, or 0 and 1) and Satisfactory (grades of C, B, and A, or 2, 3, and 4). The number and percentage of students in each academic performance group, the mean test score, and the standard deviation for each

Table 1

End-of-Course Scores on U.T. Austin Test for Credit in DPA 310 in Relation to Student Performance in DPA 310, Validity Study, Fall 1987 Semester: Frequency Distributions, Descriptive Statistics, Expected Grades, Expected Scores (N = 1,134)

Test Scores	Expected Grades	Preliminary Grades (0 - 4) in DPA 310 (0) F	(1) D	(2) C	(3) B	(4) A	Total N
142 122 -	4.00 3.35 -			4	90	160	254
121	3.31			3	16	15	34
120	3.28	1		1	18	13	33
119	3.24			2	18	4	24
118	3.20			4	24	11	39
117	3.16		2	1	27	9	39
116	3.13			4	19	9	32
115	3.09			9	21	6	36
114	3.05	1	3	4	18	5	31
113	3.01	1		5	26	6	38
112	2.98			5	27	1	33
111	2.94	1		6	16	4	27
110	2.90		1	6	16	8	31
109	2.86		1	8	19	1	29
108	2.83			10	15	5	30
107	2.79	1	1	8	18	1	29
106	2.75		1	5	28	1	35
105	2.71			7	14	3	24
104	2.68			6	12	1	19
103	2.64		4	5	13		22
102	2.60		2	8	14		24
101	2.56		3	4	13		20
100	2.53		2	4	14		20
99	2.49		2	7	15		24
98	2.45	2	2	5	8		17
97	2.41	1		4	5	2	12
96	2.38	1	1	5	8	4	19
95	2.34		1	3	2		6
94	2.30	1	1	5	7		14
93	2.26		1	6	3		10
92	2.23	1	1	6	9		17
91	2.19	1	1	3	3		8
90	2.15	1	1	2	3		7
89	2.11		1	3	3		7
88	2.08	1	1	4	2		8
87	2.04			9	2	1	12
86	2.00	1	1	4	3		9
85 - 0	1.96 - 0.00	6	17	24	13	1	61
Total		21	51	209	582	271	1,134
%		2%	4%	18%	51%	24%	100%
Mean Score		91	91	101	111	122	110.22
Standard Deviation		17	17	12	11	8	13.87
Expected Score		83	92	102	111	121	

Mean Grade	Standard Deviation
2.91	0.87

Correlation Coefficient

r = .60

Table 2
End-of-Course Scores on U.T. Austin Test for Credit in DPA 310 in Relation to Student Performance in DPA 310, Validity Study, Fall 1987 Semester: Combined Frequency Distributions, Descriptive Statistics, Regression Equations (N = 1,134)

Test Scores	Preliminary Grades (0 - 4) Unsatisfactory (0,1)	Satisfactory (2-4)	Total N
122-142		254	254
121		34	34
120	1	32	33
119		24	24
118		39	39
117	2	37	39
116		32	32
115		36	36
114	4	27	31
113	1	37	38
112		33	33
111	1	26	27
110	1	30	31
109	1	28	29
108		30	30
107	2	27	29
106	1	34	35
105		24	24
104		19	19
103	4	18	22
102	2	22	24
101	3	17	20
100	2	18	20
99	2	22	24
98	4	13	17
97	1	11	12
96	2	17	19
95	1	5	6
94	2	12	14
93	1	9	10
92	2	15	17
91	2	6	8
90	2	5	7
89	1	6	7
88	2	6	8
87		12	12
86	2	7	9
0-85	23	38	61
Total	72	1,062	1,134
%	6%	94%	100%
Mean Score	91	112	110.22
Standard Deviation	17	13	13.87

Mean Grade	Standard Deviation
2.91	0.87

Correlation Coefficient

r = .60

Equations Used to Obtain Expected Values Shown in Table 1.

Expected Scores (bottom row)
Expected Grades (second column)

Expected Score =

$$\left(\begin{matrix}\text{Prelim.}\\ \text{Grade}\end{matrix} \times 9.4670\right) + 82.6836$$

Expected Grade =

$$\left(\begin{matrix}\text{Test}\\ \text{Score}\end{matrix} \times .03749\right) - 1.2233$$

Table 3

End-of-Course Scores on U.T. Austin Test for Credit in DPA 310 in Relation to Student Performance in DPA 310, Validity Study, Fall 1987 Semester: Possible Decision Scores and Corresponding Accuracies of Placement (N = 1,134)

Placement Category	Cumulative Number of Students		Percent of Students in Each Placement Category		Overall Accuracy of Placement		
	Unsatisfactory (0,1) N=72	Satisfactory (2-4) N=1062	Unsatisfactory (6%)	Satisfactory (94%)	Accuracy Category	No. of Students	% of Students
104 - up	Too High 14	803 OK	Too High 19%	76% OK	Too High	14	1%
					Correct	861	76%
Below 104	OK 58	259 Too Low	OK 81%	24% Too Low	Too low	259	23%
103 - up	Too High 18	821 OK	Too High 25%	77% OK	Too High	18	2%
					Correct	875	77%
Below 103	OK 54	241 Too Low	OK 75%	23% Too Low	Too low	241	21%
102 - up	Too High 20	843 OK	Too High 28%	79% OK	Too High	20	2%
					Correct	895	79%
Below 102	OK 52	219 Too Low	OK 72%	21% Too Low	Too low	219	19%
101 - up	Too High 23	860 OK	Too High 32%	81% OK	Too High	23	2%
					Correct	909	80%
Below 101	OK 49	202 Too Low	OK 68%	19% Too Low	Too low	202	18%
100 - up	Too High 25	878 OK	Too High 35%	83% OK	Too High	25	2%
					Correct	925	82%
Below 100	OK 47	184 Too Low	OK 65%	17% Too Low	Too low	184	16%
99 - up	Too High 27	900 OK	Too High 36%	85% OK	Too High	27	2%
					Correct	945	83%
Below 99	OK 45	162 Too Low	OK 63%	15% Too Low	Too low	162	14%
98 - up	Too High 31	913 OK	Too High 43%	86% OK	Too High	31	3%
					Correct	954	84%
Below 98	OK 41	149 Too Low	OK 57%	14% Too Low	Too low	149	13%
87 - up	Too High 47	1017 OK	Too High 65%	96% OK	Too High	47	4%
					Correct	1,042	92%
Below 87	OK 25	45 Too Low	OK 35%	4% Too Low	Too low	45	4%
86 - up	Too High 49	1024 OK	Too High 68%	96% OK	Too High	49	4%
					Correct	1,047	92%
Below 86	OK 23	38 Too Low	OK 32%	4% Too Low	Too low	38	3%
79 - up	Too High 52	1053 OK	Too High 72%	99% OK	Too High	52	5%
					Correct	1,073	95%
Below 79	OK 20	9 Too Low	OK 28%	1% Too Low	Too low	9	<1%

Table 4

End-of-Course Scores on U.T. Austin Test for Credit in DPA 310 in Relation To Student Performance in DPA 310, Validity Study, Fall 1987 Semester: Scores Suggested by Six Guidelines for Use In Selecting Decision Scores (N = 1,134)

Guideline	Score
1. Expected Score for students whose performance in course was just minimally satisfactory (i.e., students with preliminary grades of C; see Expected Score row at bottom of Table 1).	102
2. Score for which Expected Grade was just minimally satisfactory (i.e., C; see Expected Grade column in Table 1).	86
3. Score for which percents of errors of students in each academic performance category (Unsatisfactory, Satisfactory) were most nearly equal. (See % Too High and % Too Low values in middle columns of Table 3.)	103
4. Score for which overall percents of errors were most nearly equal. (See % Too High and % Too Low values in last column of Table 3.)	87
5. Score that would have cut off (or held back) approximately the same number of students as were in the Unsatisfactory performance group. (See Table 2 for number of students in Unsatisfactory group and the test score that most nearly identifies that number of low-scoring students.)	87
6. Score that would have maximized overall accuracy of placement. (See number Correct in next-to-last column of Table 3.)	79

group appear in the bottom two rows of the table. At the right of Table 2 are the two regression equations used to estimate the Expected Scores and Expected Grades of Table 1.

Table 3 presents the expected accuracies of placement for 10 possible decision scores. At the left are the placement categories (possible decision scores). The second set of columns gives the number of students who, in each of the two academic performance categories, would have been placed too high and correctly (Unsatisfactory group) and correctly and too low (Satisfactory group) by each of the 10 possible decision scores. The third set of columns presents the same information by percentages. To the right, the overall accuracy of placement is given, by number and percentage, for both academic performance categories combined.

Table 4 lists six guidelines suggested by various authorities for selecting decision scores for use in a program of course placement and credit by examination. Each guideline refers the reader to one of the preceding tables. In this validity study, the test scores recommended by the six guidelines range from a low of 79 to a high of 103.

Discussion and Decision Making

During the January meeting, MEC staff members recommended for consideration as possible decision scores the Expected Scores for students in the C range: 99 through 104, with 99 being their first choice and 102 their second choice. Both scores met the overall University policy that requires the same standards of performance in evaluation of both course work and credit by examination. It was also noted that 99 correct answers would represent a Percentage Correct Score of 70% on the new test. The departmental representatives chose a decision score of 99 for credit with the letter grade of C. The score ranges approved by the departmental representatives for placement and credit by examination were as follows:

Test Score Range	Credit and Letter Grade
130-142	Credit with Grade of A
115-129	Credit with Grade of B
99-114	Credit with Grade of C
0- 98	No credit

Of the 63 students who took the new placement test on January 19, 1988, eight became eligible for credit by examination, six with the letter grade of C and two with the letter grade of B. The mean score for the 63 students was 76.30 (SD = 18.71). See Appendix B for a frequency distribution of the 63 test scores crossstabulated with the preliminary course grades.

APPENDIX

Appendices:

Appendix A

Student Information Handout: Credit by Examination for Data Processing and Analysis DPA 310

Appendix B

Frequency Distribution of Scores Received from First Administration of U.T. Austin Test for Credit in DPA 310, January 19, 1988

Appendix A

Student Information Handout: Credit by Examination
for Data Processing and Analysis DPA 310

The University of Texas at Austin
Measurement and Evaluation Center
2616 Wichita Street, Box 7246
Austin, Texas 78713-7246 (512) 471-3032

CREDIT BY EXAMINATION FOR DATA PROCESSING AND ANALYSIS 310

Policies for April 1988 through March 1989 Testing Periods*

U.T. Austin provides you with the opportunity to earn credit by examination. Such credit will satisfy degree requirements in the same way as credit earned by passing a course, except that it will not count as credit earned in residence. Although you may take tests before you enroll in U.T. Austin, you must be a currently or previously enrolled student in order to receive credit. Unsuccessful attempts to earn credit by examination will not become part of your official academic record.

Faculty members in the Department of Management Science and Information Systems select the test, set the levels of performance required to earn credit, and specify who is eligible to take the test. The Measurement and Evaluation Center (MEC) assists the department by communicating policies, giving the test, and reporting the credit.

U.T. AUSTIN TEST FOR CREDIT IN DATA PROCESSING AND ANALYSIS (DPA) 310

Eligibility for Credit by Examination in DPA 310: To be eligible to take the U.T. Austin Test for Credit in DPA 310, students must have credit for Math 403K or the equivalent and have neither a passing nor failing grade for DPA 310 or its equivalent.

Testing Periods: This test is offered on the U.T. Austin campus, during scheduled testing periods, several days before each class registration period. Test schedules will be available from MEC no later than one month before the beginning of the testing period.

Test Registration: Registration consists of paying the $42.00 test fee (subject to change) at specified times and place usually on the day of the test or the previous day.

Students with a significant degree of *documented* financial need are eligible for waiver of a reasonable number of test fees (contact the Office of Student Financial Aid). In order to receive test room admission slips, students must present fee waivers at the time and place where fees are paid.

Test Results: Results are available within a few days after the test, in time to register for classes. The specific time and place will be announced at the test administration.

Repeating the Test: The U.T. Austin Test for Credit in DPA 310 may only be taken once.

Admission to the Test Room: When you pay your test fee, you will be assigned to a test room. You must present, at the test room, **a generally accepted form of identification that includes both your signature and photograph.** Without it, you will be admitted only if you submit a photograph of yourself, which will not be returned to you. You should take several sharpened No. 2 pencils to the test room; all other test materials will be provided.

DESCRIPTION OF THE U.T. AUSTIN TEST FOR CREDIT IN DPA 310
The U.T. Austin Test for Credit in DPA 310 is a two hour objective test over the essentials of computer literacy for the modern business world, as well as, hands-on experience with word processing, spreadsheets, data bases and artificial intelligence tools.

LEVEL OF PERFORMANCE REQUIRED FOR CREDIT
To earn credit by examination for DPA 310, you must pass The U.T. Austin Test for Credit in DPA 310 with a grade of C or better.

*April—March testing periods encompass the registration periods for the Summer, Fall and Spring Semesters. Policies are subject to change
MEC: 2/88

Study Topics for The U.T. Austin Test for Credit in DPA 310

Test questions will be chosen from the topics which are covered in DPA 310.

The course, DPA 310, is a basic course in computer literacy and essential productivity skills for the modern business environment.

The topics include:

Computer hardware: basic components of a digital computer and their functions

Computer software: basic parts of a computer information system

System design and analysis

Word processing

Spreadsheet skills, especially business applications

The use of DBMS, especially microcomputer DBMS

Use of an Expert System shell for artificial intelligence applications

The text used at the University of Texas is Athey, Day and Zmud. Introduction to Computers and End—User Software, Scott—Foresman. The study guide that accompanies this text is also recommended.

CLAIMING CREDIT/PETITION FORM

No credit by examination will appear on your permanent record until you instruct the Measurement and Evaluation Center (MEC) to report it to the Registrar. To have credit reported, you must complete a form, *Petition to Record Credit by Examination*, and submit it to MEC. For each course in which you have earned a grade, you may choose to have the credit hours reported either with the letter grade or with the symbol CR (credit only). Credit by examination accepted as credit only will not affect your cumulative grade-point average. The petition form gives a full explanation and instructions on how to petition. After credit has been reported to the Registrar, your choice, letter grade or credit only, cannot be changed.

Although you must wait to submit a petition form until after you have begun attending classes at U.T. Austin, you may then submit it at any time during your studies here. To have credit recorded at the end of a particular semester, you must submit your petition at least five weeks before the end of classes. Petition forms are available at MEC and at the General Information and Referral Service Desk (ground floor of the Main Building).

Appendix B

Frequency Distribution of Scores Received
from First Administration of U.T. Austin
Test for Credit in DPA 310,
January 19, 1988

DPA 310 VALIDITY STUDY - COURSE REPORT

JANUARY 19,1988

SUMMARY STATISTICS

RAWSCORE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
119	1	1.6	1	1.6
115	1	1.6	2	3.2
114	1	1.6	3	4.8
112	1	1.6	4	6.3
109	1	1.6	5	7.9
108	1	1.6	6	9.5
105	1	1.6	7	11.1
103	1	1.6	8	12.7
98	1	1.6	9	14.3
97	1	1.6	10	15.9
96	2	3.2	12	19.0
95	1	1.6	13	20.6
93	1	1.6	14	22.2
90	1	1.6	15	23.8
88	1	1.6	16	25.4
87	1	1.6	17	27.0
85	2	3.2	19	30.2
83	2	3.2	21	33.3
82	1	1.6	22	34.9
81	2	3.2	24	38.1
79	2	3.2	26	41.3
76	3	4.8	29	46.0
75	1	1.6	30	47.6
74	3	4.8	33	52.4
72	3	4.8	36	57.1
71	1	1.6	37	58.7
70	1	1.6	38	60.3
69	3	4.8	41	65.1
68	1	1.6	42	66.7
66	1	1.6	43	68.3
65	2	3.2	45	71.4
63	1	1.6	46	73.0
62	1	1.6	47	74.6
60	1	1.6	48	76.2
58	2	3.2	50	79.4
57	3	4.8	53	84.1
56	3	4.8	56	88.9
55	2	3.2	58	92.1
54	1	1.6	59	93.7
51	1	1.6	60	95.2
48	1	1.6	61	96.8
46	1	1.6	62	98.4
42	1	1.6	63	100.0

OBS	N_RAW	MEAN_RAW	STD_RAW
1	63	76.3016	18.71